MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Borehole 10-01-10

Log Event A

Borehole Information

Farm : A	**Tank :** A-101	**Site Number :** 299-E24-72
N-Coord : 41,224	**W-Coord :** 47,850	**TOC Elevation :** 689.89
Water Level, ft : 123.70	**Date Drilled :** 5/3/62	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 125	

Cement Bottom, ft. : 18 **Cement Top, ft. :** 0

Borehole Notes:

Borehole 10-01-10 was originally constructed in May 1962 and completed at a depth of 75 ft with 6-in. casing. The borehole was deepened to 125 ft in 1978. The driller's log reports that a temporary 8-in. casing was installed to a depth of 18 ft and the original 6-in. casing was reused with new casing added, as required. The 6-in. casing was drilled to a depth of 130 ft and then retracted to 125 ft. Nine gal of cement grout was placed in the bottom 5 ft of the borehole. The temporary 8-in. casing was withdrawn and 36 gal of grout was injected into the space between the permanent 6-in. casing and the 8-in. portion of the borehole wall.

"As-built" drawings for the A Tank Farm indicate the original borehole was constructed with 6-in., schedule-30 pipe; however, this type of pipe was not identified in applicable engineering references. The casing thickness for the borehole is assumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. casing.

The top of the casing is the zero reference for the log. The casing lip is approximately even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1996	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Logging Information

Log Run Number : 1	**Log Run Date :** 11/26/1996	**Logging Engineer:** Alan Pearson
Start Depth, ft.: 0.0	**Counting Time, sec.:** 100	**L/R :** L **Shield :** N
Finish Depth, ft. : 43.0	**MSA Interval, ft. :** 0.5	**Log Speed, ft/min.:** n/a

Borehole 10-01-10

Log Event A

Log Run Number :	2	**Log Run Date :**	11/27/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	42.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :** N	
Finish Depth, ft. :	55.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	3	**Log Run Date :**	11/27/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	124.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :** N	
Finish Depth, ft. :	68.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	4	**Log Run Date :**	12/02/1996	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	69.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :** N	
Finish Depth, ft. :	54.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

This borehole was logged in four log runs. Water was encountered at 123.7 ft (total depth is 124.3 ft); therefore, the total logging depth achieved by the SGLS was 124 ft.

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 02/10/1998

Analysis Notes :

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing (based on a 6-in., schedule-40 pipe) were applied to the entire logged interval during the analysis process.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the

Borehole 10-01-10

Log Event A

SGLS data.

A plot of the shape factor analysis results is also included. The plot is used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.

Results/Interpretations:

The only man-made radionuclide detected in this borehole was Cs-137. Cs-137 contamination was detected continuously from the ground surface to 16 ft.

The K-40 log plot shows an interval of elevated concentrations between approximately 5.5 and 10 ft. At a depth of 12 ft, the K-40 concentration values increase from about 10 to about 13 pCi/g. At a depth of 55 ft, the K-40 concentrations increase from about 13 to about 16 pCi/g.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides. The shape factor analysis for the interval from the ground surface to about 13.5 ft is not valid because of the presence of grout on the outside of the borehole casing.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank A-101.